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Nutritional surveillance*

JOHN B. MASON[1] & JANICE T. MITCHELL[2]

The concept of nutritional surveillance is derived from disease surveillance, and means "to watch over nutrition, in order to make decisions that lead to improvements in nutrition in populations". Three distinct objectives have been defined for surveillance systems, primarily in relation to problems of malnutrition in developing countries: to aid long-term planning in health and development; to provide input for programme management and evaluation; and to give timely warning of the need for intervention to prevent critical deteriorations in food consumption. Decisions affecting nutrition are made at various administrative levels, and the uses of different types of nutritional surveillance information can be related to national policies, development programmes, public health and nutrition programmes, and timely warning and intervention programmes. The information should answer specific questions, for example concerning the nutritional status and trends of particular population groups.

Defining the uses and users of the information is the first essential step in designing a system; this is illustrated with reference to agricultural and rural development planning, the health sector, and nutrition and social welfare programmes. The most usual data outputs are nutritional outcome indicators (e.g., prevalence of malnutrition among preschool children), disaggregated by descriptive or classifying variables, of which the commonest is simply administrative area. Often, additional "status" indicators, such as quality of housing or water supply, are presented at the same time. On the other hand, timely warning requires earlier indicators of the possibility of nutritional deterioration, and agricultural indicators are often the most appropriate.

Data come from two main types of source: administrative (e.g., clinics and schools) and household sample surveys. Each source has its own advantages and disadvantages: for example, administrative data often already exist, and can be disaggregated to village level, but are of unknown representativeness and often cannot be linked with other variables of interest; sample surveys provide integrated data of more or less known representativeness, but sample sizes usually do not allow disaggregation to, for example, specific villages. A combination of these sources, with a capability for ad hoc *surveys (formal or informal) is often the best solution. Finally, much depends on adequate facilities for data analysis, even though simple, comprehensible data outputs are what is required. Intersectoral cooperation is needed to provide realistic options for the decision-making process.*

The consequences of inadequate nutrition are well known and of wide concern within the health sector and elsewhere. At a certain degree of severity of malnutrition, children are faced with an increased risk of dying, almost always from concurrent infectious disease. There is some evidence that malnutrition decreases one's immunity and hence predisposes to disease. In more general terms, good health is impossible without good nutrition, so that nutrition is recognized as a prerequisite of health for all.[a] Over and above these health-

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[1] Director, Cornell Nutritional Surveillance Program and Senior Research Associate, Division of Nutritional Sciences, Cornell University, 145 Savage Hall, Ithaca, New York 14853, USA.

[2] Research Support Specialist, Cornell Nutritional Surveillance Program.

[a] WHO Technical Report Series, No. 667, 1981 (*The role of the health sector in food and nutrition*: report of a WHO Expert Committee).

related concerns, malnutrition results from a denial of basic human needs, and is recognized as a symptom of poverty and as a problem in its own right, so that the elimination of malnutrition is becoming an objective of national and international policies. The trouble is the uncertainty on how most effectively to tackle the problem.

Surveillance of infectious diseases, by keeping track of disease incidence, has been a support to the health services in allowing timely prevention and treatment and in assessing progress. By analogy, the idea of nutritional surveillance has appeal for preventing malnutrition, particularly but not exclusively in the developing countries. This idea first came to prominence at the World Food Conference of 1974, and since that time the concept has evolved and been applied in a number of developing countries. This process led to a definition of nutritional surveillance as "to watch over nutrition, in order to make decisions which lead to improvements in nutrition in populations".[b]

This article outlines some recent experience in nutritional surveillance and offers to those who are concerned with malnutrition some guidance on how to proceed, based on this experience. At the same time, certain outstanding issues for developing successful nutritional surveillance are referred to. Success means, of course, actually preventing or alleviating malnutrition, and only in this context are the more technical aspects of data collection, management, and analysis relevant. A smoothly operating nutritional surveillance system that did not benefit the malnourished would be irrelevant; however, too often attention is focused on obtaining reliable data and not on what to do about the problem thus observed, whether reliably or not.

At present, some 20 or more countries have programmes that fall within our definition of nutritional surveillance, and there is an evolving consensus on the purposes and means of operation of nutritional surveillance systems. A brief historical sketch may be useful by way of introduction. The immediate result of the 1974 World Food Conference's call for nutritional surveillance was the convening of a joint FAO/UNICEF/WHO Expert Committee, whose report describing a proposed methodology was published in 1976.[c] By 1979, enough experience had been gained in the developing countries to justify a review of progress in nutritional surveillance.[b] Thus it became evident that essentially three related, but distinct, objectives were being pursued, and that there was advantage in making these distinctions explicit since the objectives should guide the design of the systems. Nutritional surveillance systems were being developed:

(*a*) for long-term planning in health and in development;
(*b*) for programme management and evaluation; and
(*c*) for timely warning and intervention to prevent critical deteriorations in food consumption.

These objectives are not mutually exclusive, but priorities have to be set because not all the objectives are necessarily appropriate at the same time, nor indeed can they usually all be met at once. In line with this focus, the emphasis in designing nutritional surveillance has shifted to give absolute priority to defining the decisions needed, at various levels of administration, to improve nutrition; and then to match the data requirements to this end alone. Only the information necessary for making important decisions should be put out; this is consistent with the original concept stemming from disease surveillance.

The review of progress begun in 1979 provided material for two regional workshops: in Cali, Colombia, in 1981[b] and in Nairobi, Kenya, in 1982.[d] It was also the basis for a book

[b] *Report of the International Workshop on Nutritional Surveillance, Cali, Colombia, 14–17 July 1981.* Rome, ACC-SCN, 1982 (document SCN 82/10).

[c] WHO Technical Report Series No. 593, 1976 (*Methodology of nutritional surveillance*: report of a joint FAO/UNICEF/WHO Expert Committee).

[d] *Report of a Workshop on Social and Nutritional Surveillance in Eastern and Southern Africa, held in Nairobi, Kenya, 17–19 May 1982.* New York, UNICEF/Cornell, 1982.

(now in press),[e] where more detailed discussion of many of the points covered in this article may be found.

PURPOSES OF NUTRITIONAL SURVEILLANCE

Decisions that influence the nutritional conditions of populations may be made at several different levels of administration. These decisions may be in relation to (1) policies and programmes that can fundamentally affect people's living standards in the long term, (2) programmes that provide for more immediate alleviation of hunger and malnutrition, or (3) a number of intermediate possibilities. The decisions essentially involve the allocation of resources for the benefit of deprived groups of people through alternative activities. Generally, the objective of nutritional surveillance is to provide information so that decisions can be made that are more favourable to nutrition; this in turn will lead to the allocation of resources for the benefit of the malnourished in such a way that their nutrition will improve. We have suggested a classification of policies and programmes that are related to nutrition as follows:

(*a*) National policies
(*b*) Development programmes
(*c*) Public health and nutrition programmes
(*d*) Timely warning and intervention programmes.

Useful information can be provided to these programmes by nutritional surveillance systems, as indicated in Table 1. Since the purpose of nutritional surveillance dictates how

[e] MASON, J. B. ET AL. *Nutritional surveillance*. Geneva, World Health Organization (in press).

Table 1. Policies and programmes affecting nutrition

Policy or programme	Relevance of information from nutritional surveillance
National policies, e.g.:	Planning
– resource allocations, by area and sector	
– legislative: e.g., price policy, commodity flows, minimum wages	
– programme directions: e.g., promoting different crops, preventive/curative health	
Development programme measures, e.g.:	Planning and evaluation
– area development programmes	
– commodity programmes	
Public health and nutrition programmes, e.g.:	Planning and evaluation
– environmental health	
– primary health care	
Timely warning and intervention programmes	Initiating interventions
– for famine prevention	
– for alleviating seasonal food shortages	

(*Source*: Table 1.3 in MASON, J. B. ET AL. *Nutritional surveillance*, Geneva, World Health Organization (in press)).

it will be carried out (there are, for example, distinctly different data needs for long-term planning compared with timely warning), it is important that the decisions should be identified as closely as possible with the specific policies and programmes for which data are needed.

The usefulness of nutritional surveillance is thus dependent in the first place on the potential for taking action to improve nutrition. Realizing this potential depends on the commitment to this objective at high decision-making levels and a willingness to make available the resources and the necessary trade-offs against other objectives. Further, it requires suitable institutional arrangements to link decision-making with implementation and with the necessary information on which to base decisions. There is as yet very limited experience in all this. However, in a number of countries there are now adequate commitments and resources, and the crucial step required is to feed into the decision-making process realistic options that are favourable to nutrition. To take a closer look at the minimum information likely to be useful for different purposes, a useful starting point is to define the questions.

Questions to be answered

The information needed for decisions on national policies and programmes can be defined through answers to such questions as the following:

1. Are there certain population groups with worse nutrition than others, and what are their characteristics?
2. Is the overall nutrition situation deteriorating or improving? Is this the same for all groups? How are groups with particular problems defined? Can these trends be explained?
3. Are there indications of specific short-term nutrition problems at present? Are there indications of future problems?

To answer these questions, data are needed on indicators of nutritional conditions, disaggregated by relevant groupings (such as area, occupation and resource endowment) and repeated over relatively long periods of time (i.e., usually years).

Of the outputs so far obtained in nutritional surveillance systems aimed at planning and programming, most have succeeded in answering only the first question, generally using cross-sectional data analyses—e.g., in Costa Rica, Kenya and the Philippines.[f] In some cases, data have been collected over a period of time, but these have still to be analysed to investigate the changes in nutrition and their possible causes.

The information required for programme management and evaluation is different, in terms of the variables required, the frequency of data collection and analysis, the level of aggregation, and so on. Here, it is suggested that simple data on programme delivery, and on trends in the nutrition of the population concerned, would give useful information for management purposes on the adequacy of programme implementation. There are two relevant questions to ask.

(i) Is the programme being delivered as planned to the intended target group?
(ii) Is the gross change in their nutrition adequate?

The data to answer the first question can come from administrative records (e.g., on programme delivery, and matching these with an identification of the planned target groups). This allows derivation of indicators showing how far the target groups are

[f] *Surveillance summaries.* New York, Cornell Nutritional Surveillance Program (CNSP), 1982 (Working Paper Series, No. 3).

included in the programme, and to what extent those in need are actually recipients. The second issue refers to the overall (gross) trend in the nutritional status of the recipients, without taking into account the changes that might have occurred anyway. Indicators of nutritional status may often be obtainable through programme contacts.

Nutritional surveillance programmes aimed specifically at preventing short-term food crises include within the programme itself the means for intervening when necessary; hence they are referred to as "timely warning and intervention programmes". Such programmes aim to give information so that interventions to prevent a serious decline in food consumption could be planned, with sufficient lead time to put the interventions in place. The required indicators will therefore describe the situation prior to the deterioration in nutritional status, and will involve such factors as rainfall, the area under cultivation and other agricultural indicators, as well as, on occasions, indicators of early responses to anticipated food shortage. Generally, the administration of such programmes should be decentralized. Nutritional status indicators may be included, but more as a fail-safe mechanism than to provide the timely warning itself.

STEPS IN DESIGNING A NUTRITIONAL SURVEILLANCE SYSTEM

A nutritional surveillance system includes the processes of decision-making and of providing the necessary information to guide these decisions, for which data collection, flow and analysis are required. Clearly the first steps in designing such a system should be to decide on its purposes, with the linkages to decision-making (as exemplified in Table 1), and the associated specific questions that need to be answered. These have been summarized in the previous section. Elsewhere, we propose a procedure for this,[g] and have begun to test it. It has proved helpful to specify, early on, the potential uses and users of the system, and then to look into suitable indicators, data sources and analytical requirements. Throughout, the institutions contributing to the surveillance system should be involved, and suitable institutional arrangements made for its functioning. The issues involved in designing such a system provide convenient headings for describing the system. The rest of this article therefore follows these headings.

Uses and users of nutritional surveillance information

Potential users of nutritional surveillance information are to be found in various sectors because there is a complex of factors leading to malnutrition and because of its close relation to poverty. Although it is unrealistic to expect nutrition generally to play a leading part in decisions on overall resource allocations, nutritional surveillance can be used to analyse policies for their nutritional consequences, to suggest alternative policy options, and eventually to assess their actual nutritional effects. There is an advocacy role for long-term surveillance of nutrition to reinforce other similar considerations in trying to influence the fundamental causes of malnutrition. However, there is probably most potential for bringing about policy changes that are favourable to nutrition with reference to specific, selected issues. Whilst these issues may often be less than fundamentally related to the basic causes of malnutrition, such as the inequitable distribution of resources, decisions on them in reality have a better chance of being influenced by nutritional considerations. Three areas are reviewed here: agricultural and rural development planning; the health sector; and large-scale nutrition and social welfare programmes.

[g] See Chapter 2 of the book mentioned in footnote *e*.

Agricultural and rural development planning

Agricultural ministries regard themselves as having a primary responsibility for food, certainly in terms of supply, if not always of consumption (and, not infrequently, supply is considered to determine consumption). They also hold a key place in their *potential* for affecting nutrition, since many of the malnourished are the poor in rural areas, who depend on agriculture for their livelihood. Since in practice the food availability of the poor, including the farmer, depends on their real income and hence purchasing power, and since this in turn depends on the profitability of agricultural production in rural areas, agricultural policies inevitably have important effects on nutrition. These policies, which may be primarily aimed at objectives such as overall food self-sufficiency or export earnings, none the less embody choices which can have better or worse effects on nutrition. Such decisions will be based on questions such as what to produce, who produces it, who is helped to produce and how by inputs and services, what price the farmer gets paid, and the like. A second set of decisions, at policy level, will often depend on the prices set for the consumer; for example, staple food prices are frequently controlled and influence the food consumption patterns, especially of the poor.

Now, there is no suggestion that these decisions could *primarily* be based on nutritional considerations. They do have far-reaching nutritional consequences, and under certain circumstances (defined above all by political, economic, and institutional considerations) the decisions may be modified by having better information and will lead to more favourable effects on nutrition. This information is at present largely confined to cross-sectional assessments of the likely nutritional effects; as nutritional surveillance develops, the actual effects on nutrition and on satisfying the basic needs of agricultural policies may provide more powerful arguments for improving nutrition through these means. There are a few examples of progress in this area. The increasing attention to the possible deleterious effects of concentration on certain export crops is one example; appreciation of the difficulties of reaching the small farmer, combined with increasing knowledge that it is those with the smallest landholdings who have the most malnutrition, is lending some weight to efforts to benefit the small farmer and landless labourer.

Much of the investment in production resulting from such policy decisions is channelled through agricultural and rural development projects. These provide an easier case for introducing nutrition, both in planning and through monitoring of their effects on nutrition and on living standards. Indeed, it is becoming recognized that indicators such as those used in nutritional surveillance are of general application for this purpose, not only because of their obvious relevance to the quality of life but because they are also relatively easy to collect and are quite widely available. The users here may again be ministries of agriculture, or government planning offices responsible for area development. In this context, it is also feasible and important that the donor agencies cooperating with governments in agricultural and rural development should be aware of and use nutrition information in project planning. The issues are similar to those at national level, if more restricted and more easily focused. They revolve around questions of how far the needy can participate in such projects, and whether the benefits, usually primarily in terms of income, are likely in fact to improve nutrition. One major reason for the breakdown in the linkage between income and better nutrition is when sources of income change, perhaps because of changes in agricultural patterns, notably (but not confined to) shifts from subsistence to marketed production. Experience on this matter is being gained in a number of projects, led by FAO.[h]

[h] LUNVEN, P. & SABRY, Z. I. Nutrition and rural development. *Food and nutrition review*, 7: 13-21 (1982).

Health sector

The potential users of nutritional surveillance data in the health system include those who have to make decisions about the distribution and effective use of scarce resources; these range from the Minister of Health to the primary health worker in an isolated rural health post. The decisions usually relate to planning of services or management and evaluation of existing programmes.

At the national level, for the introduction or expansion of primary health care, decisions are made on where to place health centres, how many staff to assign, and what services to provide. Knowing the number of malnourished persons and where they are can be criteria upon which to base these decisions. Guidance can be provided on the types of activities in the health sector. In a congested urban slum, malnutrition may be secondary to frequent intestinal infections which suggests the need for environmental health workers capable of evaluating, correcting and monitoring water supply and sanitation facilities. A rural area which is prone to seasonal food shortages might benefit more from inputs to improve local diets, the introduction of home gardens, and coordination with local agricultural extension agents in promoting crops less prone to drought or crops that could be grown in the off-season.

In local clinics, nutritional surveillance data can be used to identify pockets of malnutrition or seasonal periods so that appropriate interventions can be planned. These data, along with disease surveillance and administrative data, can also be used to justify requests for additional personnel, training programmes, or supplies required to meet identified needs.

Nutritional surveillance systems can provide some information necessary for the evaluation of health programmes. Anthropometric data, observed over a period of months or years, provide an indicator of gross outcome, i.e., whether nutritional conditions have improved or deteriorated.[i] Further analysis, usually with additional data, can then be used to investigate why the programme is or is not having the desired impact.

In the uses discussed here, nutritional surveillance has many similarities with health information systems. It should not be developed in isolation from health information systems for the health sector's use. Depending on the state of development of the available health information, nutritional surveillance for health uses can form part of a broader information system or, in some cases, take a lead in providing data for this purpose. Both the principles and indicators used are similar; nutritional status is one of the priority indicators proposed for health monitoring, and several other indicators are common to both ideas (see next section).

Nutrition and social welfare programmes

In certain countries, notably in Latin America, large-scale nutrition and social welfare programmes are being adopted. These usually include nutritional surveillance for programme planning, management and evaluation as a more or less integral part of the programme. A well known example is in Costa Rica, where the Nutrition Information System (*Sistema de Información en Nutrición*) has provided many important results for the family welfare (*Asignaciones Familiares*) programme and been used more widely in development planning. In the Philippines, nutrition information is used both centrally and locally for the planning and management of nutrition programmes.

Here again, nutritional surveillance information is used initially to identify the areas or occupational groups of high malnutrition prevalence, which would merit high priority for

[i] See Chapter 5 of the book mentioned in footnote *e*.

special nutrition services. Later, the data are useful for evaluating the programme's effectiveness, both in terms of overall results and how far it has reached those for whom the programme was intended. The gross outcome or overall effect of a programme can be measured by seeing if the target population has benefited, e.g., by a gain in weight. Anthropometric data, according to targeted and actual recipients, can show whether those most in need were identified to receive the programme and if in fact they are receiving the programme. Additional useful information would be to discover how many of those who receive the programme are really in need of it.

Indicators

For planning, programme management, and evaluation, the most usual outputs from nutritional surveillance involve one or more nutrition outcome indicators, disaggregated by descriptive variables. The nutritional outcome indicators generally include one or more of the following: prevalence of malnutrition among pre-school children (e.g., percentage of children less than 80% weight-for-age, or second and third degree Gomez classification—i.e., less than 75% weight-for-age); prevalence of low birth-weight infants (less than 2.5 kg); prevalence of stunting (less than 90% height-for-age) in school entrants; and estimates of infant and/or child mortality rates. Other outcome "status" indicators, generally presented as a series alongside nutritional outcome indicators, include such measures as quality of housing, water supply and sanitation, literacy rates, etc. Initially, such indicators are used cross-sectionally, i.e., at one point in time; with progress, changes over a period of time can be traced.

The commonest classifying or descriptive variable is simply the administrative area, and indeed this is the most relevant for many programmes, particularly in the health sector. Beyond this, the appropriate classification depends on the particular use, e.g., by ecological zone, cropping area, farm size, etc., which may be suitable for agricultural use, or by accessibility, use of services, endemic disease areas, and environmental factors for other programmes. The associations between such factors may be closely analysed to get a clearer view of the possible causes (and hence a plan for interventions) and to study the programme's impacts during evaluation.

For timely warning and intervention programmes, different indicators are required. These can often be identified by historical analysis. Here, the object is to pick up signs of deterioration in sufficient time to intervene: the timing becomes a compromise between the prediction and the lag period required to launch the preventive measures. Agricultural indicators (e.g., on crop damage), food prices, and population responses to shortage (e.g., migration and distress selling) are suitable indicators under different circumstances.

In all these cases, the indicators may not fully define the problem, its changes and causes. Rather, surveillance information gives clues on where to look and what needs to be looked for. Often further investigation, which may be informal rather than involving numerical data, may then be needed; in this, there is a close resemblance to the original concept of infectious disease surveillance.

Data providers

In general, the available data sources are of two types: administrative and survey, each with its own advantages. Data from administrative sources tend to be more numerous, so that they can be disaggregated to refer to particular geographical areas, often down to the village level. On the other hand, the representativeness of the data is usually unknown. Data often refer to geographical units such as the village, rather than to households. It is

rare that more than a few variables are available for the individuals referred to; for example, occupation may be recorded at the same time as a disease is reported, but even then this information is seldom passed on. Some integration of data may be possible at the village or district level. Sample survey data, on the other hand, are usually available at household level, provide an integrated data set, often with a wide range of useful variables, and are of more or less known representativeness. However, the cost usually precludes large sample sizes, so that it is usually not possible to disaggregate the data down to the level of individual villages of interest; indeed, this is not the purpose of most sample surveys.

Nutritional surveillance systems generally depend to a considerable extent on administrative data, usually from the health system. Sample survey data, exploiting the relative advantages of the two sources, are also often added. Some details of both types of data source are given below.

Administrative data sources

The commonest sources of administrative data are from the health system, from schools, and from local government registration of vital statistics. Health facilities—hospitals, clinics, rural health centres and subcentres—frequently record births, death by age and cause, and specific diseases by the numbers of people seen per time period. Not infrequently, such data are *recorded* within the local health facility but are not *reported* to the regional or national levels. This is particularly true for anthropometric data, now that many clinics record the weight-for-age of pre-school children on health cards which are usually kept by the child's mother. When these data are tallied, sometimes on a sampling basis, useful indicators of current malnutrition may be reported. For example, this is done in Colombia for health reporting, and in Botswana to monitor the effects of drought. Home visits by health workers may provide another source of information on living conditions (housing, sanitation, water supply) as well as on health and nutrition. In Costa Rica, home visits are regularly made to a majority of rural households. Anthropometric, socioeconomic and housing data are collected and reported through the health system. A central agency (the *Sistema de Información en Nutrición* mentioned above) analyses the data and distributes the information to interested agencies and ministries.

In the elementary schools of many countries the children are weighed and measured on a regular basis, particularly at school entry. Often these data are carefully recorded on the appropriate form and just as carefully filed away for ever. Retrieval of these data and analysis by particular groups could give reliable indicators of changes in long-term nutritional status. Even if such measurements are not routinely made, a simple measuring device and instructions can be sent through the post. Surveys using this potentially important source of data have been carried out in Costa Rica and the Philippines. In countries with a high rate of school enrolment, this method of long-term nutritional monitoring may become of increasing importance.

Local administrative records on births and deaths are at present likely to be the least reliable of these administrative sources, but it may be worth the investment to improve them. Infant and child mortality rates are of fundamental concern well beyond the specific interests of nutritional surveillance. Further, many birth and death certificates record additional information, such as occupation, location, etc., and may provide insights over and above the simple rates.

Information on rainfall and crop progress is particularly important in nutritional surveillance systems designed to give timely warning of food shortages. Rainfall data may be collected by weather stations of the meteorological service and may be reported through the ministry of agriculture. On occasions, suggestions have been made to set up simple rainfall reporting through other means, e.g., schools or farmers' associations. Reports

from agricultural extension workers, both informally on crop progress and to give estimates of yields, production, and/or areas harvested, can be used for early warning; for example, in Indonesia, an indicator derived from estimates of the proportion of planted areas subsequently harvested is used to locate the areas of potential food shortage, and to give preliminary warning of the severity of such shortages. For longer-term planning, estimates of food production themselves are not generally directly useful by area, because of difficulties in measuring trade; more useful data could be obtained by estimating the values of agricultural production by area, although as yet such methods are not in wide use. Reliable data on agriculture more often come from surveys, as discussed in the next section.

Surveys

Nutritional data are obtained from sampled households either by surveys specially designed for the purpose, or by adding a "nutritional module" onto pre-existing surveys. The latter, which involves training enumerators to measure children and administer a short questionnaire, as well as supplying relatively inexpensive equipment, has the advantage both in being less costly and in providing a set of data in which nutritional status is potentially linked to a broad range of variables of interest. When the survey is longitudinal (i.e., with repeated measurements on the same or similar households), periodic nutritional status measurements give time-series data to assess changes in nutritional status, thus addressing the second question specified earlier for planning. This is how nutritional surveillance is approached in Kenya (where three rounds of nutritional data have been obtained at 2–3-year intervals by this means). With the trend to build up such continuing survey systems, for which the United Nations Household Survey Capability Program is lending valuable support, this method of nutritional surveillance should become more important in the future.

Ad hoc surveys — for programme design, monitoring, and quick assessment — may form part of a nutritional surveillance system. The capability for carrying out such surveys can usefully be established as part of the system. Conversely, some surveillance activities draw on surveys that have been carried out for other purposes, such as the use of labour and employment surveys in Costa Rica. A simplified methodology for purposes of project assessment has been developed by FAO, and national survey methods used extensively by the US Centers for Disease Control. These methodologies are being published as a series of manuals. However, considerable caution is required before embarking on a sample survey; the purposes and need for the survey should be carefully specified, down to details of the questions that really need to be answered. Not infrequently it will be found that the use of existing data, or retrieval of information that exists, e.g., in clinics, may achieve much of the purpose at a fraction of the cost. But when justified, a carefully designed survey with adequate analysis can give information obtainable in no other way.

Data analysers

A key factor in much of nutritional surveillance has been the data analysis and who does it. Obtaining suitable data outputs, adequately interpreted in relation to the decisions and within reasonable time periods, is not easy in many developing countries. In most cases, fairly simple and comprehensible data outputs, if carefully planned, are what is needed. Tabulations of nutritional and related outcome indicators by suitable groupings (often administrative areas) that are presented strikingly to planners can guide decision-making. For example, in Costa Rica the demonstration that about 10% of the administrative districts had a high prevalence of height retardation (noted in the school survey), with

certain other indicators derived from the census, led to substantial reallocation of resources to these areas.

The central unit, with primary responsibility for designing the system and for analysis and interpretation of the data, is the core of most surveillance programmes. Gathering the required capability in terms of enough people with the right skills may require links with other institutions, and technical assistance especially for training and the development of appropriate methods. Probably there is a minimum level of effort, in the system itself more than elsewhere, below which it is difficult to make the system run. A number of full-time staff are assigned to this task in almost all the systems that are running promisingly. This capability is generally best located within a government agency, including the statistical office. The skills required include, but go beyond, health and nutrition, and involve statistics and/or epidemiology, some computing capability, as well as economics and planning. Beyond the primary interpretation of data, there is also substantial benefit in more detailed analysis, both for policy purposes and for research to develop the system; and, for this, links with research institutions can be valuable.

Finally, cooperation between those responsible for data collection, for analysis, and for the regular use of information for decision-making is essential and requires working institutional arrangements. There are generally more data collected than compiled, more compiled than analysed, and more analysed than used. The main constraints are not only technical, but institutional and political. To design and maintain a useful system, much hinges on good working relations between the different institutions concerned, and the realization that there are common objectives is indispensable.

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